Hydrologic Model Manager

Short Name	CEQUEAU
Long Name	
Description	
Model Type	Water balance distributed conceptual model
Model Objectives	Estimating streamflow at any points of the watershed. Predict the effect of any physical modification ofthe watershed. Short-term and mid-terrn forecasting for, hydroelectric power production, floods and droughts.
Agency _Office	INRS-Eau (Quebec University) 2800 Einstein Street Postal Box 7500 Sainte-Foy, Quebec, CANADA G1V 4C7
Tech Contact	Guy Morin INRS-Eau (Quebec University) 2800 Einstein Street Postal Box 7500 Sainte-Foy, Quebec, CANADA G1V 4C7 Fax: (418) 654-2600 E-mail guy_@morin@inrs-eau.uquebec.ca
Model Structure	Two main functions. Production function schematized by intercommunicating reservoirs and transfer function for channel routing.
Interception	
Groundwater	
Snowmelt	
Precipitation	
Evapo-transpiration	
Infiltration	
Model Paramters	Externally derived parameters: 3 parameters determined from hydrological and physiographic characteristics of the watershed. Calibration parameters 17 parameters determined by trial and error (this number may be reduce) and 11 parameters determined from physical laws.
Spatial Scale	Subdivision of the watershed with a square grid. The model was used with square of 0.1 km to 30 km for watershed of I km@ to I 00,000 km'.
Temporal Scale	Time interval for the simulation are: 1, 2, 3, 4, 6, 8, 12 or 24 hours.
Input Requirements	Input Data Requirements: Physiographic data required The data required for each "whole square" are: • altitude; • percentage of forested area; • percentage of lakes; • percentage of marshes; The data required for each "partial square" are: • the direction of water flow; • its relative aerial percentage with respect to the "whole square". Temporal data required

	For simulation: • maximum and minimum air temperatures at the meteorological stations • liquid and solid (optional) precipitation at the meteorological stations • snow depth surveys (optional) • observed streamflow for the calibration period. For short term forecasting: • forecasting of air temperatures at the meteorological stations or at some points of a grid or means within the watershed; • forecasting of liquid and solid (optional) precipitation at the meteorological stations or at some points of a grid or averages within the watershed; For mid-tenn forecasting: • historical meteorological data (air temperature and precipitation) averaged over the whole watershed.
Computer Requirements	PC 486 or Pentium Memory size: 16 Meg RAM Disk space: 10 Meg Exploitation systems: Windows 3. 1, Windows 95/98 or Windows NT
Model Output	Simulation results (streamflow, water level, snowmelt, snowcover, evaporation, forecast etc ...) are saved on different files and may be analysed with the help of different types of graphs created with CEQUEAU interface. Three (3) types of graphs are available: graphs for spatial data graphs for temporal data graphs for forecast data.
Parameter Estimatn Model Calibrtn	The adjustment of the parameters of the CEQUEAU model is done by trials and errors or by optimization.
Model Testing Verification	The verification of the adjustment of the model is done by analysis of numerical criteria and the analysis of the results presented on graphs.(We maintain one period which will be used for verification only)
Model Sensitivity	
Model Reliabiity	The accuracy of CEQUEAU model was tested in comparison with other well known hydrological models in the world in the framework of two inter-comparisons of hydrological models fostered by the World Meteorological Organization (WMO). (WMO, 1986, 1992).
Model Application	In the last decades, the CEQUEAU model has been used for many watersheds, varying from I to I 00,000 km2 in the Province of Quebec, in Canada and elsewhere in North and South America. It is also used in Europe and Africa. In the Province of Quebec, it was applied on some sixty watersheds and used to determine probable maximal floods (PMF) in many watersheds of northern Quebec. The CEQUEAU model is presently used on a regular basis by some institutions in the Province of Quebec to forecast flow rates in real time.
Documentation	Morin, G., Sochanski W., Paquet, P. (1998). Le modele de simulation de quantite CEQUEAU-ONU, Manuel de references. Organisation des Nations-Unies et INRS-Eau rapport de recherche no 519, 252 p. Morin, G., Paquet, P., Sochanski W. (1995). Le modele de simulation de quantite et de qualite CEQUEAU, Manuel de references. INRS-Eau rapport de recherche no 433, 341p. World Meteorological Organization (1986). Intercomparison of models of snowmelt runoff. Geneva Switzerland Operational Hydrology WMO, no.646. World Meteorological Organization (I 992). Simulated real-time intercomparison of hydrological models. Geneva Switzerland Operational Hydrology WMO no.779. MORIN, G., NZAKIMUENA, T.J., SOCHANSKI, W. (1994). Prevision des temperatures de l'eau en riviere avant et apres le detoumement d'un tributaire:

	Le cas de la riviere Moisie. Canadian Journal of Civil Engineering, 21(l): 65-75. MORIN, G., SLIVITZKY, M. (1992). Impacts de changements climatiques sur le regime hydrologique: le cas de la riviere Moisie. Revue des Sciences de l'eau et Revue Hydrologie Continentale, 5. p. 179-195. COUILLARD,D.,CLUIS,D.,MORIN,G.(1988). An extension of the grid-based hydrological model CEQUEAU to suspended sediment movement through drainage basins. Water Resources Research, 22(8): 991-999. MORIN, G., CLUIS, D., COUILLARD, D., JONES, G. et GAUTHIER J.M. (1988). Modelisation de l'azote total en riviere A l'aide du modele quantite-qualite CEQUEAU. Canadian Journal of Civil Engineering, 15(3): 315-322.
Other Comments	Choice of language for windows and printed graphs. The languages presently available are: English, Spanish, French, Polish and Portuguese.
Date of Submission	5/8/2001 1:52:18 PM
Developer	
Technical Contact	
Contact Organization	